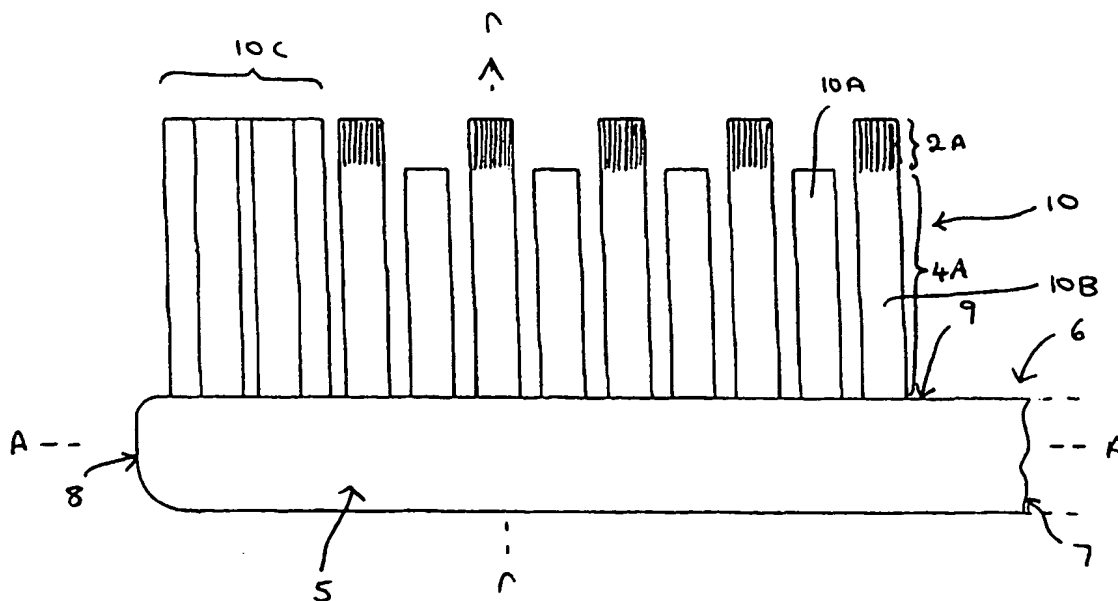


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(54) Title: TOOTHBRUSH



(57) Abstract

A toothbrush in which the bristles project to at least two distinct heights from the bristle face, and the bristles which project to the greatest height are feathered bristles with their free ends split to produce soft fine strands.

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Toothbrush

This invention relates to toothbrushes, in particular to hand held toothbrushes for manual use. In particular the invention relates to the bristle group on the toothbrush head.

5 Toothbrushes generally comprise a grip handle and a bristle bearing head, from a bristle face of which project bristles, the head and handle being disposed along a longitudinal axis, generally with a thinned neck in between the head and handle.

10 Usually the bristles are all of substantially the same length, so that the free ends of the bristles lie generally in a flat plane substantially parallel to the longitudinal axis. However bristle groups are known in which the free ends of the bristles lie in a "square wave" or "castellated" arrangement of alternating long and short tufts e.g. as disclosed in DE P 44 09 395, US 3,229,318 and US 4,672,706. Also bristle groups are known in which the free ends of the bristles lie in a
15 "triangular wave" or "zig zag" arrangement of sharp peaks with troughs in between, e.g. as disclosed in US 3,188,673, US 2,797 424, US 74560 and WO 91/19437 among others.

Bristles are normally made of resilient flexible plastics material filaments with solid rounded ends. However a bristle material called "feathered filaments" is
20 known and available from DuPont under the Trade Mark "Tynex". These feathered filaments can be split at the ends such that the end, remote from the toothbrush head, of each such feathered bristle filaments is divided longitudinally into numerous fine soft fine strands. See for example the DuPont publication "Tynex Shapes & Textures Toothbrush Filaments" (1996).

25 It is an object of this invention to provide a toothbrush with an improved cleaning effect of the interdental spaces, and this is unexpectedly achieved in the present invention as described below.

According to this invention a toothbrush is provided, from a bristle face of the head of which project a group of bristles, *characterised* in that the bristles in the
30 group project to at least two distinct heights from the bristle face, and the bristles of the group which project to the greatest height are feathered bristles.

The feathered bristles may be provided on the toothbrush of the invention as sold with their ends already in the form of numerous fine soft fine strands, or alternately the toothbrush may be supplied to the user with the bristle ends unsplit, and the bristles may split at their ends remote from the bristle face into numerous
5 fine soft fine strands during use, e.g. as a result of the forces and conditions experienced by the bristles during toothbrushing.

The non-feathered bristles may be essentially conventional bristles as normally used on toothbrushes, preferably having their ends remote from the bristle face end-rounded.

10 The distinct heights to which the bristles project may differ in their respective height by 5-30%, e.g. 5-20%, typically 5-10% of the average height to which the bristles project from the bristle face of the toothbrush of the invention.

In a preferred embodiment of the invention the bristles of the group are disposed in discrete tufts which project to two distinct heights from the bristle face,
15 i.e. of higher and less high tufts, and the higher tufts are comprised of feathered bristles with their free ends split to produce soft fine strands.

Preferably the tufts of the group are arranged in a longitudinally aligned "square wave" or "castellated" form of a pattern of higher feathered and less high non-feathered tufts. For example the tufts of the group may be arranged in a
20 longitudinally alternating pattern of laterally, i.e. widthways perpendicular to the longitudinal axis of the toothbrush, extending rows, or groups of laterally extending rows, of higher feathered and less high non-feathered tufts. For example the tufts of the group may be arranged in a longitudinally alternating pattern of laterally extending groups of rows of higher and less high tufts. For example the tufts of the
25 group may comprise laterally extending rows of tufts, and one or more such rows of higher, feathered, tufts may alternate longitudinally with one or more rows of less high non-feathered tufts. For example the group may comprise higher single laterally aligned rows of feathered tufts alternating with single alternating rows of less high non-feathered tufts. In one form of this group the row nearest the base of
30 the head (facing the handle) and the row nearest the tip may be longer feathered bristles, or alternatively they may be shorter non-feathered bristles.

The feathered bristles in the toothbrush of this embodiment having a square wave form may be higher than the less high non-feathered bristles by about 5-30%, e.g. 5-20%, typically 5-10% of the average length of the bristles. In terms of distance feathered bristles in the toothbrush of this embodiment having a square wave form group may be higher than the less high non-feathered bristles by typically 0.5-4 mm, e.g. ca. 1.5 mm. The whole or part of that length of the feathered bristles which projects higher than the free ends of the non feathered bristles may be feathered, i.e. with their free ends split to produce soft fine strands.

Alternative arrangements of bristles are within the scope of this invention. For example the toothbrush may have the free ends of its bristles in its group lying in a "triangular wave" or "zig zag" arrangement of sharp peaks with troughs in between, for example individual tufts of bristles may have their free ends in a conical or gable shape (e.g. with the ridge of the gable oriented laterally), which may be symmetrical or asymmetrical about the bristle length axis, and the highest parts of the peaks, e.g. the highest about 5-30%, e.g. 5-20%, typically 5-10% of the bristles, may be feathered. For example the peak itself and optionally the parts of the bristles immediately adjacent to the peak may be feathered.

All the tufts of bristles in the toothbrush may be included in such a group of tufts as described above, referred to for convenience hereinafter as the "first group". Alternatively only part of the entire bristle group of the toothbrush of the invention may be included in such a first group, and the toothbrush may have a first group of bristles as described above, combined with groups of bristles in other arrangements to that of the said first group.

In a particularly preferred form of the invention such a first group of bristles, e.g. a square wave or zig-zag form first group, preferably a square wave or castellated form first group, is combined with a second group of bristles located at the tip end of the first group, the second group being in plan on the bristle face a distinct cluster of tufts, or a distinct single tuft of larger cross section than that of the tufts in the first group, the cluster or tuft being of a polygonal or rounded shape in plan.

Such a cluster may for example comprise a polygon of tufts, e.g. a hexagon, pentagon, quadrilateral, heptagon or octagon, which may be regular or irregular in shape and/or in the length of its sides, preferably surrounding a central tuft.

Alternatively the polygonal cluster may comprise a number of closely longitudinally spaced lateral rows of tufts, for example with these lateral rows interpenetrating longitudinally. Such a cluster may comprise tufts which are longitudinally or laterally spaced differently to the tufts of the first group.

Preferably this polygonal cluster comprises a hexagon of tufts with a central tuft, or a quadrilateral of tufts, and is combined with a square wave form first group located between this cluster and the base end of the head.

Rounded shapes of such a cluster include circular, semicircular, oval and half-oval.

A single distinct tuft may comprise a single polygonal or rounded tuft larger in cross section than the individual tufts of the first group. By "rounded" is included *inter alia* circular, semi circular, oval, semi oval, "U" shaped and "C" shaped etc., with the limbs of the U or C facing the base of the head.

Preferably the bristles in the second group are higher than the less high non-feathered bristles of the first group, preferably being of the same length as the higher feathered bristles. Alternatively the bristles in the second group may be less high than the higher feathered bristles, or may be of a height unrelated to the height of either the higher feathered or less high non-feathered bristles. The tufts in the second group may for example be spaced together more closely than are the tufts in the first group. The bristles in this second group may be feathered or non-feathered, for example non-feathered.

In one form of the toothbrush of this invention the first group comprises 6-10 lateral rows of tufts made up of the said alternating pattern of square wave or castellated -form tufts, with a second group in the form of a cluster of tufts at the tip end. For example the toothbrush may comprise 7-9 rows of tufts in a first group starting at the base end and ending at its tip end with a higher feathered row of tufts, including longer feathered tufts with shorter non-feathered tufts alternating with these. At the tip end of this pattern the second group may be in the form of a

cluster of tufts comprising a hexagon with a central tuft or the said quadrilateral of tufts.

The head of the toothbrush may taper, being wider at its end nearest the handle than at the tip remote from the handle, such that the width of the second
5 group of tufts is less than the width of the first group immediately adjacent to the first group. This tapering may be in a wedge-shaped manner.

A suitable arrangement of tufts on the bristle face of the toothbrush is that disclosed in DE 44 09 395, the contents of which are included by reference. Such a bristle arrangement for example has a toothbrush head from which all the bristles
10 project at right angles, a first group of bristles towards the handle being grouped together in tufts arranged in transverse rows extending at right angles to the longitudinal axis of the toothbrush head, the height of the bristles of the first group oscillating up and down, the height of the tufts of the first group alternating in
successive transverse rows between two different height levels; a second group of
15 bristles located at the free end of the toothbrush head forming a rounded cluster of bristles and the distance between the first and second group being the same as or smaller than the same distance(s) between the transverse rows of the first group.

For example the tufts of the first group may be arranged in nine widthways aligned rows, the rows successively having 5, 5, 5, 4, 4, 4, 3, 3, 3 tufts in each
20 row counting from the base of the head, being successively alternately long "l" (feathered) and short "s" tufts, i.e. a 5l, 5s, 5l, 4s, 4l, 4s, 3l, 3s, 3l arrangement.

The feathered bristles may be of circular cross section, of a diameter similar to conventional non-feathered bristles. The feathered and non-feathered bristles may have a diameter of typically 0.10-0.25 mm, for example the higher bristles,
25 feathered and non feathered may have a diameter 0.15-0.20 mm and the less high bristles may have a diameter of 0.17-0.25 mm.

The bristle face of the toothbrush of the invention may be substantially planar, and the difference in height between the feathered and non-feathered bristles may be achieved by the feathered bristles being longer and hence extending further
30 from the bristle face. Alternately or additionally the bristle face may be non-planar, e.g. having parts which are respectively displaced to greater and lesser extents from

the longitudinal axis of the toothbrush, and the higher, feathered bristles may extend from these more displaced parts.

The head and handle of the toothbrush of this invention may also include features known by themselves in the art but novel in combination with the bristle configuration of this invention. For example the handle of the toothbrush, the head, and/or the link between the head and handle of the toothbrush may incorporate features which modify flexibility, for example as disclosed in PCT/EP92/00645, EP 0336641, WO 92/17093, PCT/EP96/03721, WO 97/24048, WO97/25899, WO 97/25900, the contents of which are hereby incorporated by reference.

The toothbrush of this invention may be made by conventional techniques and materials, e.g. by injection moulding of plastic materials, and of elastomer grip pads on the grip handle and flexible composite plastics material-elastomer material links between the head and grip handle. The bristles may be fixed into the head by means of conventional techniques, e.g. with small metal clips jammed into socket holes in the head, or by fusing the fixed ends of the bristles into the head material.

The invention will now be described by way of example only with reference to the accompanying drawings which show:

Fig 1 - an enlarged view of the feathered end of a feathered bristle.

Fig 2 - a side view of the head of a toothbrush of this invention.

Fig 3 - a plan view of the head of a toothbrush of this invention.

Fig 4 - a side view of an alternative type of tuft of feathered bristles of a toothbrush of this invention.

Referring to Fig. 1, the region at the end remote from a toothbrush head, of an individual feathered bristle 1 (generally) is shown. The bristle material is commercially available and is made of the material Tynex™ supplied by DuPont, and is made with small voids and weld lines that run along the length of the bristle. This enables the end 2 of the bristle to split into numerous soft, fine strands 3. The lower part 4, of the bristle 1 is not split in this way but is a solid bristle. Such splitting may occur during use of the toothbrush.

Referring to Figs 2 and 3, a toothbrush head 5 is shown in a side view, a base end 6 of which longitudinally adjoins a grip handle (not shown) via a thinned

neck 7, the head having a tip end 8. From a bristle face 9 of the head project
bristles arranged in discrete tufts 10 of bristles, the tufts being of substantially
circular cross section as shown in Fig 3. The toothbrush has a longitudinal axis A--
A, a width direction B--B perpendicular to the axis A--A, and being in the plane of
5 the paper of Fig. 3, and a height direction C--C perpendicular to both the axis A--A
and the width B--B, i.e. being in the plane of the side view Fig. 2.

The tufts 10 are arranged in a first group of a longitudinally alternating
arrangement of laterally aligned rows of less high shorter tufts 10A and laterally
aligned rows of higher longer tufts 10B, and at the tip end of this first group there
10 is a second group in the form of a distinct cluster of tufts 10C in a hexagon around
a single central tuft 10D.

In the first group the shorter tufts 10A are tufts of non-feathered bristles,
being bristles having a substantially solid rounded end. The tufts 10B are tufts of
feathered bristles 1 as shown in Fig.1. The length of the non feathered bristles in
15 tufts 10A is ca. 9 mm, and the length of the feathered bristles in tufts 10B is ca. 11
mm. The whole part 2A of the feathered bristles in the tufts 10B which projects
higher than the free ends of the non feathered bristles 10A is feathered, i.e. the ends
2 of the individual bristles in the region 2A of the tufts 10B are split into numerous
soft, fine strands 3, whereas in the lower part 4A, of the tufts 10B the individual
20 bristles 1 in the tufts 10B are not split in this way but is a solid bristle. The tufts
10C are non-feathered and have a length substantially the same as that of the
feathered bristles 10B.

As seen in Figs 2 and 3 the alternating arrangement comprises five laterally
aligned rows 10B of feathered bristles, and four laterally aligned rows 10A of
25 shorter non-feathered bristles, the arrangement starting at the base end with a row
of longer tufts 10B of feathered bristles. These rows 10A, 10B, starting from the
base end 6, contain respectively 5, 5, 5, 4, 4, 4, 3, 3, 3, tufts. The spacing, both
laterally and longitudinally, of the tufts 10C in the tip cluster is closer than the
spacing of the tufts 1A, 10B.

30 Referring to Fig 4, an alternative tuft configuration is shown. In Fig 4 part
only of the bristle face 9 of a toothbrush head 5 is shown. The toothbrush of Fig 4

has tufts 10 E extending from its bristle face 9. The free ends of the bristles in these tufts 10E lie in a "triangular wave" or "zig zag" arrangement of sharp peaks 11 with troughs 12 in between. This is achieved by individual tufts 10E of bristles having their free ends in a gable shape with the ridge of the gable oriented laterally, i.e. perpendicular to the axis A--A, these peaks 11 being symmetrical about the bristle length axis A--A. The highest parts of the bristles in the tufts 10E, i.e. the peak 11 itself and the parts of the bristles immediately adjacent to the peak 11 are feathered, i.e. in the region 2B of the tuft 10E the ends of the bristles are split into numerous soft, fine strands 3. The bristles in the lower part 4B, of the tuft 1 are not split in this way but are solid bristles.

In use the toothbrush of this toothbrush is used for toothbrushing in exactly the same manner as a conventional toothbrush, and the higher feathered bristles in tufts 10B and peaks 11 more advantageously clean the interdental spaces between the teeth.

15

Claims:

1. A toothbrush, from a bristle face of the head of which project a group of bristles, *characterised* in that the bristles in the group project to at least two distinct heights from the bristle face, and the bristles which project to the greatest height are feathered bristles with their free ends split to produce soft fine strands.
2. A toothbrush according to claim 1 *characterised* in that the said distinct heights to which the bristles project differ in their respective height by 5-30% of the average height to which the bristles project from the bristle face of the toothbrush.
3. A toothbrush according to claim 1 or 2 *characterised* in that the shorter tufts are comprised of non-feathered bristles.
4. A toothbrush according to any one of claims 1 to 3 *characterised* in that the bristles of the first group are disposed in discrete tufts which project to two distinct heights from the bristle face, the higher tufts are comprised of feathered bristles with their free ends split to produce soft fine strands and the less high tufts are comprised of bristles having non-feathered ends.
5. A toothbrush according to claim 4 *characterised* in that the tufts of the first group are arranged in a "square wave" form of an alternating pattern of higher and less high tufts.
6. A toothbrush according to claim 5 *characterised* in that the tufts of the first group are arranged in a longitudinally alternating pattern of higher and less high tufts or groups of laterally extending rows of tufts.
7. A toothbrush according to claim 6 *characterised* in that the tufts of the first group comprise laterally extending rows of tufts, and one or more such rows of higher, feathered, tufts alternate longitudinally with one or more rows of less high non-feathered tufts.
8. A toothbrush according to claim 7 *characterised* in that the first group comprises higher single lateral rows of feathered tufts alternating with single alternating rows of less high non-feathered tufts.

9. A toothbrush according to claim 7 *characterised* in that the row nearest the base of the head (facing the handle) and the row nearest the tip, may be longer feathered bristles.
10. A toothbrush according to any one of claims 5 to 9 *characterised* in that the
5 feathered bristles in the toothbrush of this embodiment having a square wave form first group are higher than the less high non-feathered bristles by about 5-30%.
11. A toothbrush according to any one of claims 1 to 4 *characterised* in that the toothbrush has the free ends of its bristles in its first group lying in a "triangular wave" or "zig zag" arrangement of sharp peaks with troughs in between.
- 10 12. A toothbrush according to claim 11 *characterised* in that individual tufts of bristles have their free ends in a conical or gable shape and the highest parts of the peaks are feathered.
13. A toothbrush according to any one of the preceding claims *characterised* in that all the tufts of bristles in the toothbrush comprise a square wave or zig-zag
15 form first group of tufts.
14. A toothbrush according to any one of claims 1 to 12 *characterised* in that the toothbrush has a first group of bristles combined with groups of bristles in other arrangements to that of the said first group.
15. A toothbrush according to claim 14 *characterised* in that a first group of
20 bristles is combined with a second group of bristles located at the tip end of the first group, the second group being in plan on the bristle face a distinct cluster of tufts, or a distinct single tuft of larger cross section than that of the tufts in the first group, the cluster or tuft being of a polygonal or rounded shape in plan.
16. A toothbrush according to claim 15 *characterised* in that a second group is
25 present in the form of a cluster comprising a polygon of tufts surrounding a central tuft.
17. A toothbrush according to claim 16 *characterised* in that the polygonal cluster comprises a hexagon of tufts with a central tuft and is combined with a square wave form first group located between this cluster and the base end of the
30 head.

18. A toothbrush according to any one of claims 15 to 17 *characterised* in that the bristles in the second group are higher than the less high non-feathered bristles of the first group.

19. A toothbrush according to any one of claims 15 to 18 *characterised* by
5 comprising 6-10 lateral rows of tufts made up of an alternating pattern of wave-form tufts, with a second group in the form of a cluster of tufts at the tip end.

20. A toothbrush according to claim 19 *characterised* by 7-9 rows of tufts in a first group starting at the base end and ending at its tip end with a higher feathered row of tufts, including longer feathered tufts with shorter non-feathered tufts
10 alternating with these, and at the tip end of this pattern a second group in the form of a cluster of tufts comprising a hexagon with a central tuft or the said quadrilateral of tufts.

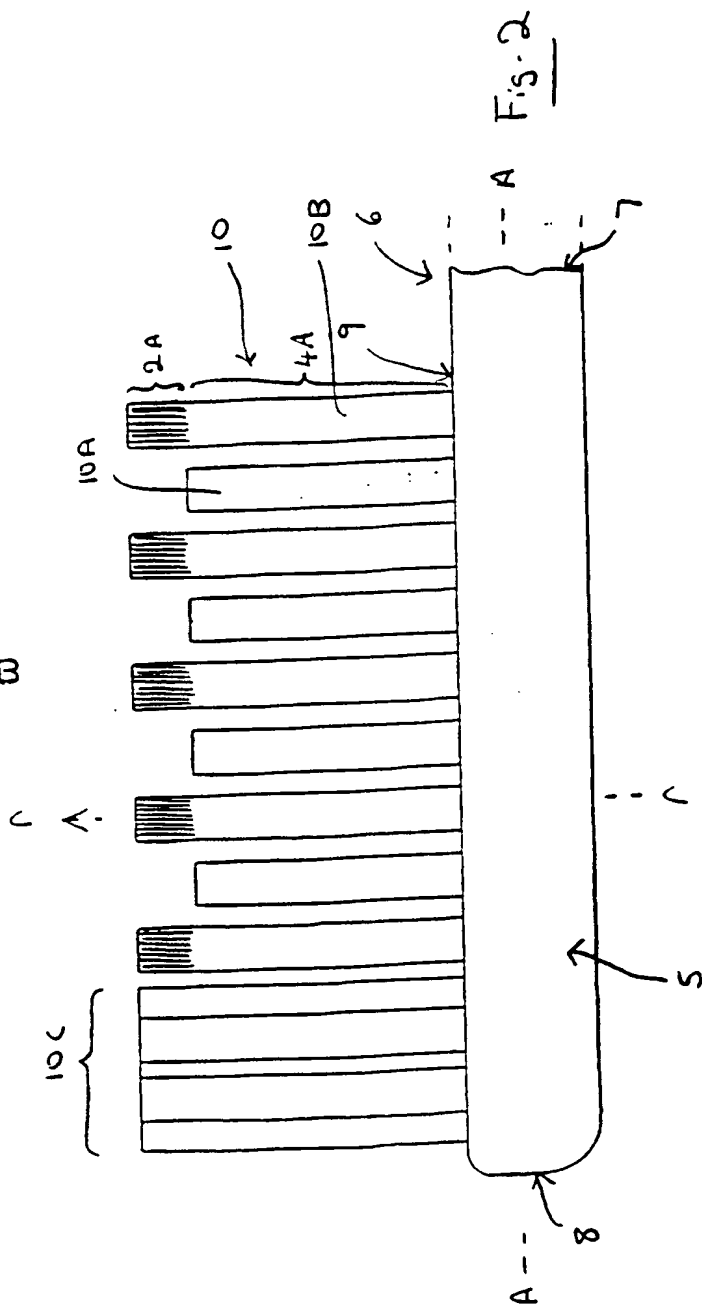
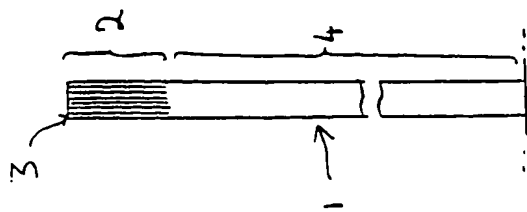
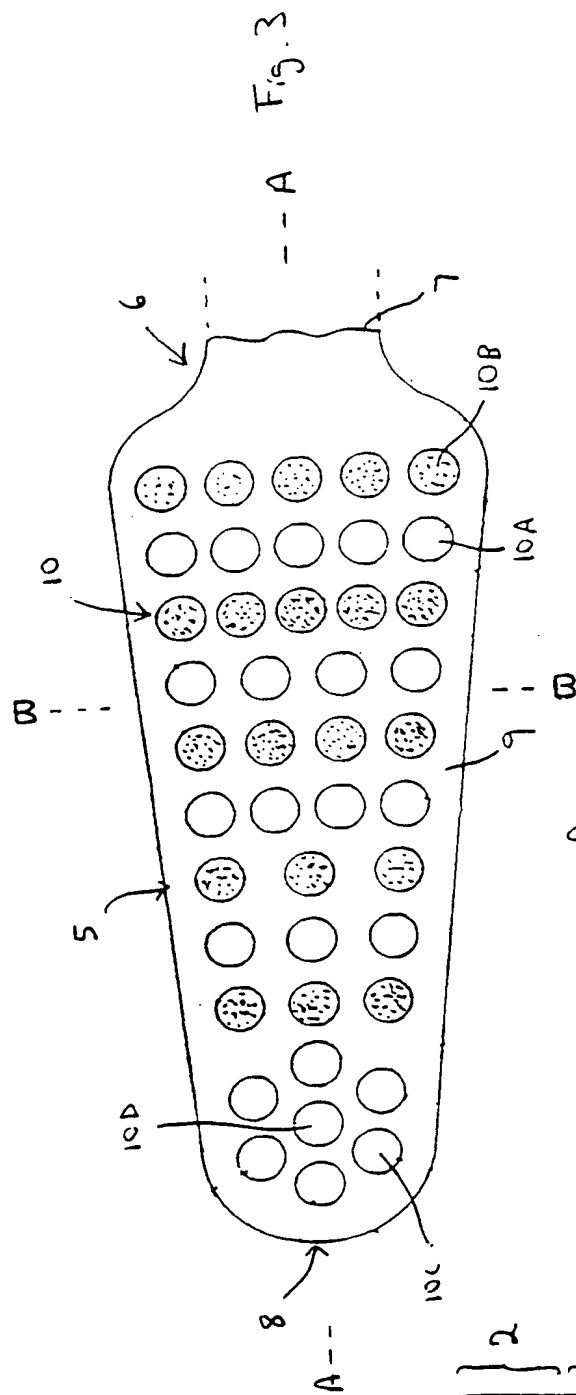
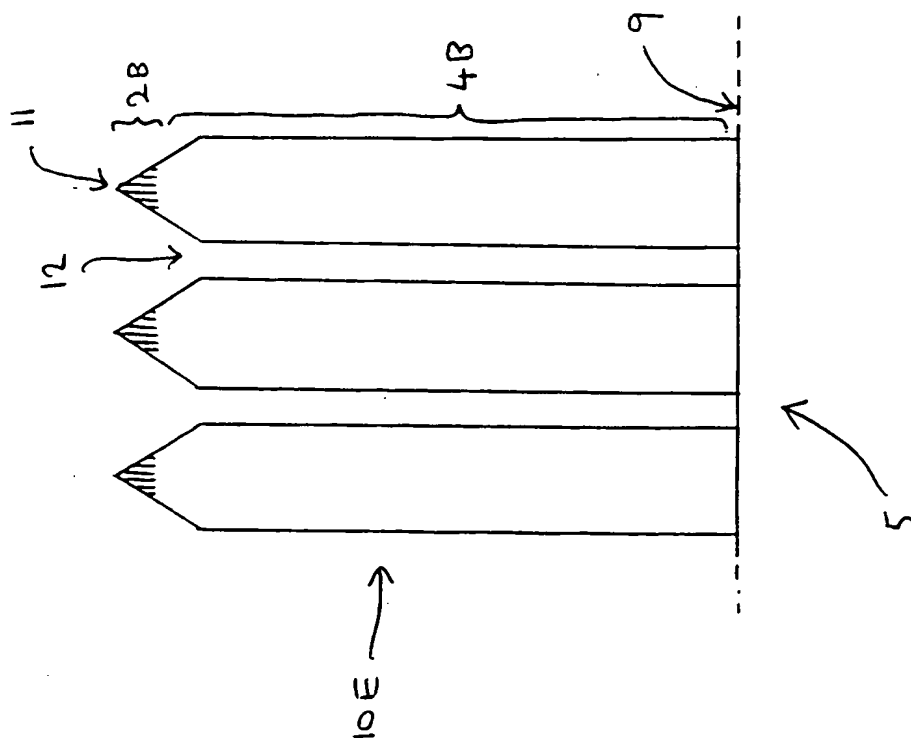


Fig. 4



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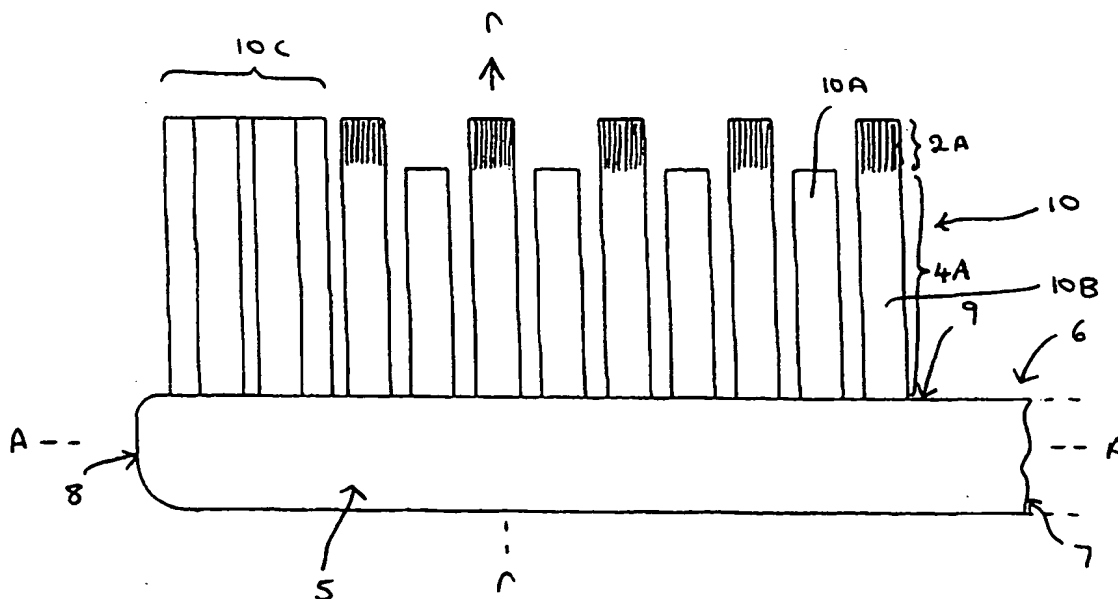
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(57) Abstract

A toothbrush in which the bristles project to at least two distinct heights from the bristle face, and the bristles which project to the greatest height are feathered bristles with their free ends split to produce soft fine strands.

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INTERNATIONAL SEARCH REPORT

national Application No
PCT/98/01291

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A46B9/04 A46D1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A46B A62B A46D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	FR 2 587 183 A (TRENTINI) 20 March 1987 see the whole document ---	1-11, 13, 14
Y,P	WO 97 25902 A (COLGATE-PALMOLIVE CO) 24 July 1997 see page 3, paragraph 2 - page 4, paragraph 3; figures ---	1-11, 13, 14
Y	DE 295 20 641 U (RUEB) 21 March 1996 see page 6, line 25 - page 9, line 23; figures ---	11
A	DE 94 08 268 U (SEEVER) 14 July 1994 ---	1-20
A	WO 96 16571 A (THE PROCTER & GAMBLE CO) 6 June 1996 ---	1-20
-/--		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

10 September 1998

Date of mailing of the international search report

18/09/1998

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INTERNATIONAL SEARCH REPORT

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PCT/EP 98/01291

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 672 706 A (HILL) 16 June 1987 -----	1-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/98/01291

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 2587183	A	20-03-1987	NONE	
WO 9725902	A	24-07-1997	AU 1137497 A	11-08-1997
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